What's up with Linear Technology?

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Last month, Linear Technology celebrated its thirty year anniversary as an innovator of analog integrated circuits. Since the company was founded in 1981, the worldwide analog market grew from $2 billion annually to more than $40 billion. That got me wondering, how have things changed at Linear over the years? Bob Dobkin, VP Engineering, Chief Technical Officer, and Linear co-founder was gracious enough to sit down with the RF & Microwave Designline and tell us about it.

RF & Microwave Designline (RFMW): What inspired you to found the company?
Bob Dobkin: The five original founders of Linear Technology all came from National Semiconductor. The linear group there was doing really well at the time, but despite the fact that we were coming out with great products and selling them, there was little money available to advertise the 'linear' products. So, we decided to start our own company as specialists in high-performance analog. Of course, National sued us for the next two years.

RFMW: When you founded Linear in 1981, what was your best-case scenario for how the company would do? How did things match up?
Dobkin: We didn't need to be the biggest, but we wanted to be very profitable. We just wanted to make high-performance analog products. We stuck to this philosophy over the past thirty years, and I think it worked out well. When we were starting we were thinking five years ahead, and we thought that if we got to $100 million dollars we would be a great company. History shows we blew through that.

RFMW: What was the secret to your success?
Dobkin: We put in the infrastructure, picked the engineers, and built a fab. We made sure that our products worked really well before we released them. Recognizing that there weren't a lot of analog experts out there (this is still true), we hired many as many as we could afford as well as application engineers to help customers use our products. Today, with thousands of transistors in a product, we still need those application engineers more than ever

RFMW: What was Linear's first major advancement?
Dobkin: I think one of the things we are proudest of is that we broke-even very quickly. In fact, we broke-even running our own fab and our own wafers at $15 million dollars a year, which made us independent from requiring further venture capital.

RFMW: Why did you build your own fab?
Dobkin: We designed the parts, manufactured the silicon, and sub-contracted the assembly. To make high-performance analog products, we needed to have fabs where we can control and tweak the process. The processes we needed, like bipolar transistors, higher voltages, low-noise transistors, and thin-film resistors were not available in foundry fabs that make their money running high volumes of digital ICs in CMOS. Now we have two fabs, one in Milpitas, California and one in Camas, Washington.

RFMW: What remains one of LTC's biggest challenges?
Dobkin: One of our most limiting resources is good design engineering. So, we make an effort to make products that are long lasting; ones that sell in moderate volumes for ten, twenty, even thirty years. In fact, some of the products I designed in the 1970s are still in volume production today. If you design products that are at the limit achievable in performance, then once you've made it you don't have to do it again!

RFMW: Any regrets? Any roads you wish you had taken?
Dobkin: I look at what we've achieved: a great reputation both with our customers and financial companies. We did this by doing what we knew how to do very well, making technical advances in the areas where we have a lot of understanding. There are probably a few other areas we could have gone into, but it wasn't what we were strongest at. I think we did the right thing. No one here has any regrets about our product base, manufacturing, customer support, or applications support. We don't look at another company and say, I wish we were like them.

RFMW: What has surprised you the most about analog technology over the past 30 years?
Dobkin: I think what was most surprising was the influence of digital processing on analog technology. Digital is, and always has been, the driver in semiconductor equipment. If you look at high-performance digital products, there are very fine line widths and 20-50 masks, yet still they have a defect density that gives high yield. If I take those technologies and transfer them over to analog, it allows me to make products that couldn't have been made thirty years ago. Simply put, complementary bipolar circuits could not have been made without the ability to use 30-50 mask layers. Smaller line widths help us make converters and high performance power devices in reasonable sizes (our industry would never have supported the revenue to evolve to smaller line widths). We have developed our process around the equipment that was increasingly available because of digital processing, and we made better products because of them.

RFMW: Any advice for start ups in this market today?
Dobkin: The analog market is much tougher now than it was, and you've got to have plenty of funding. Then, you have to deliver the quality people expect. There has to be some reason for people to buy your product, it has to have an attraction for the customer. If you are going into analog, your philosophy ought to be high-performance products and being able to stay the course for several years. If your plan is to go in and be the cheapest guy on the market, you will have a tough time because there will always be someone cheaper than you.

RFMW: What do you wish new EEs knew about analog ICs?
Dobkin: One of the greatest challenges we have: finding enough experienced, smart, analog engineers. So, we grow them or we hire them if they are experienced. However, good analog guys are well coveted by a lot of companies because there are not enough of them around. It was actually a bit easier when we first started because analog was not nearly as sophisticated as it is now. We wish there was more analog coursework in the universities' EE programs. One of the things that has been dropped from many degree programs is bipolar transistor design.

RFMW: Any funny stories from your days on the job?
Dobkin: This is a long story that goes back to 1975 during my time at National. Back then digital clocks and calculators were very expensive. Our VP had a digital clock calculator on his desk using chips that National made. We built a little box that changed 60 cycles to 58 and made his clock run slowly, and we installed it in the fuse box. He sent the clock down to the design team to have it fixed. Of course, then it ran slowly again. This went on for nine months. Finally, he finds my box in the fuse box. He did not think it was very funny!

But, this started a series of pranks. In our design area, we had a battery operated wall clock, which started running slowly. We had it replaced, and then it started running fast. We opened it up and saw that someone had messed with the crystal. So, we replaced the crystal. That night it was switched again, so we aimed a motion-activated camera at the clock. We found a note over the lens of the camera, "You aren't going to catch me with that!" Then, the clock started running backwards. We switched all the wires, but it stall ran backwards. We called the engineer who designed the clock, who asserts the clock cannot run backwards. We finally determined that someone filed the pole pieces in the clock so that it can only run backwards. In response, we put the numbers up backwards...This went on for about a month before we figured it was Jim Williams.

RFMW: How would you sum up the last 30 years at LTC?
Dobkin: It's been fun. The thing I like best is coming out with new and interesting products and watching customers accept them. That's part of being an entrepreneur. All of our engineers are interested in seeing their products do well. We've created an entire company of entrepreneurs, making products and watching them go...and it's going great!

About Bob Dobkin

Bob Dobkin is a founder and Chief Technical Officer of Linear Technology Corporation. Prior to 1999, he was responsible for all new product development at Linear. Before founding Linear Technology in 1981, Mr. Dobkin was Director of Advanced Circuit Development at National Semiconductor for eleven years. He has been intimately involved in the development of high performance linear integrated circuits for over 30 years and has generated many industry standard circuits. Mr. Dobkin holds over 100 patents pertaining to linear ICs and has authored over 50 articles and papers. He attended the Massachusetts Institute of Technology.

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